IPET STUDY TASK 9: THE ENVIRONMENTAL CONSEQUENCES

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Presented By:
Richard. A. Cole, Ph. D.
Environmental Subtask Leader
Institute for Water Resources

SUBTASK PURPOSE AND OBJECTIVES

PURPOSE:

Address the environmental consequences from flooding of greater New Orleans associated with Hurricane Katrina.

OBJECTIVES:

Characterize and compare four conditions:

- **The pre-Katrina condition**
- **The post-Katrina baseline condition (flood protection from all but direct rainfall)**
- **The post-Katrina actual condition (observed state)**
- **The June 2006 condition anticipated following a repeat of Hurricane Katrina.**

APPROACH

- Select ecological resource indicators
- Concept model of region & process
- Mine existing data
- Gather original data
- Model contaminants transport

ECOLOGICAL RESOURCE INDICATORS

ECOLOGICAL RESOURCE INDICATORS:

Resource Species Condition

- Fisheries
- Wildlife
- Pests
- Special Status Species

Surviving Rail at Bayou Sauvage NWR

Supporting Ecosystems Condition

- Estuaries
- Fresh to saline wetlands
- Coastal ocean and barrier Islands

FWS

SPECIAL STATUS SPECIES MOST LIKELY TO BE AFFECTED BY FLOODING OR FLOODWATER PUMPING EITHER DIRECTLY OR INDIRECTLY THROUGH HABITAT OR FOOD CONTAMINATION

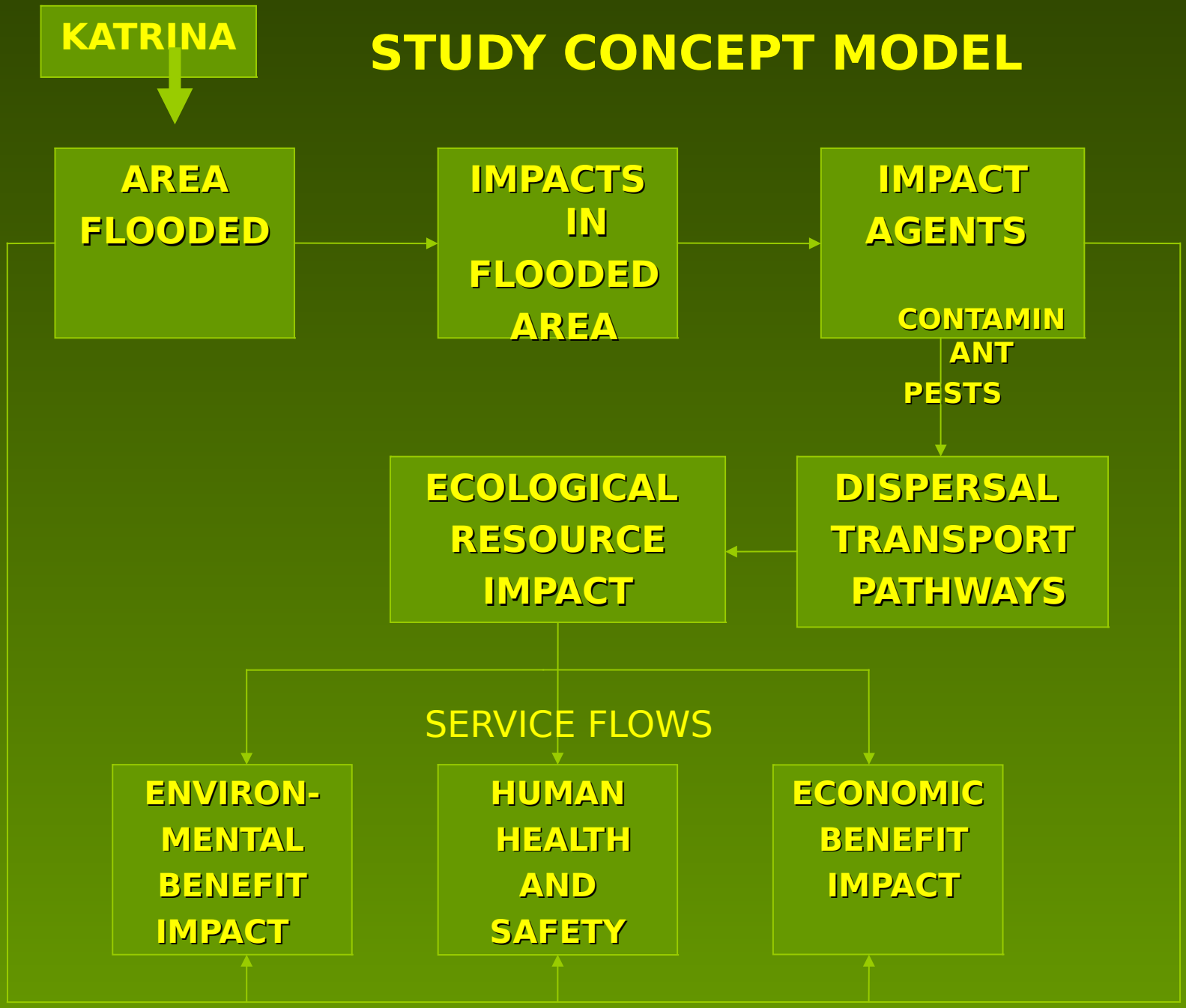
Scientific Name	Common Name	State Rank	Global Status	Federal status	State Status
Acipenser oxyrinchus desotoi	Gulf sturgeon	S1S2	G3T2	LT	Threatened
Alosa alabamae	Alabama shad	S1	G3	C	
Haliateetus leucocephalus	Bald eagle	S2N,S3B	G4	PS:LT,PDL	Endangered
Pelicanus Occidentalis	Brown pelican	S2	G4	PS:LE	Endangered
Trichechus manatus	Manatee	SNA	G2	LE	Endangered

REGIONAL ECOSYSTEM TYPES

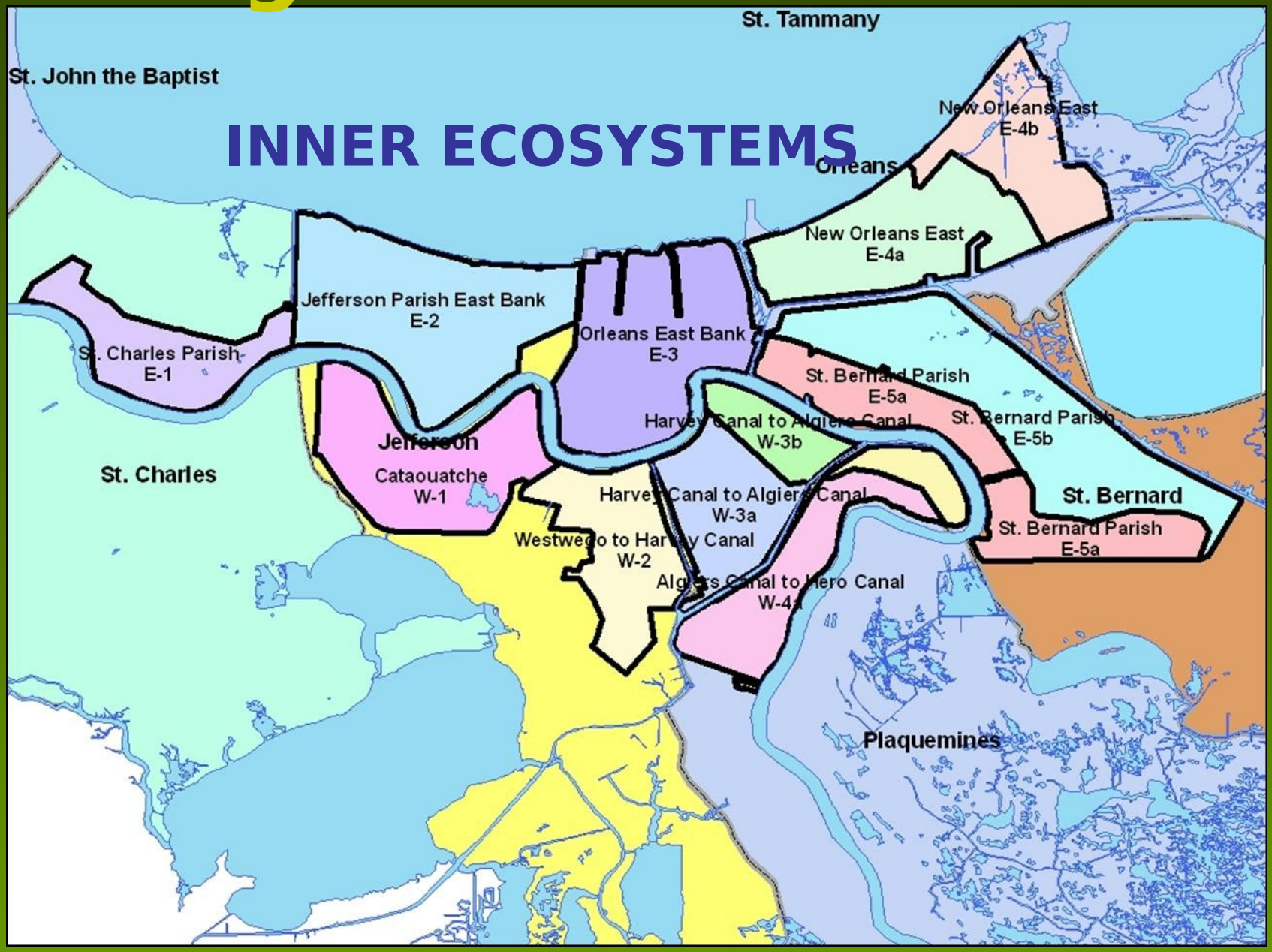
ECOSYSTEM TYPE	AREA KM^2	% AREA
FRESH MARSH	3,829	11.1
FORESTED WETLAND	5,935	17.1
BRACKISH MARSH	4,704	13.6
SALINE MARSH	1,659	4.8
WATER BODIES	10,491	30.3
FORESTED UPLAND	2,022	5.8
DEVELOPED	1,649	4.7
AGRICULTURE	3,943	11.4
TOTAL	34,609	100.0

CONCEPT MODEL

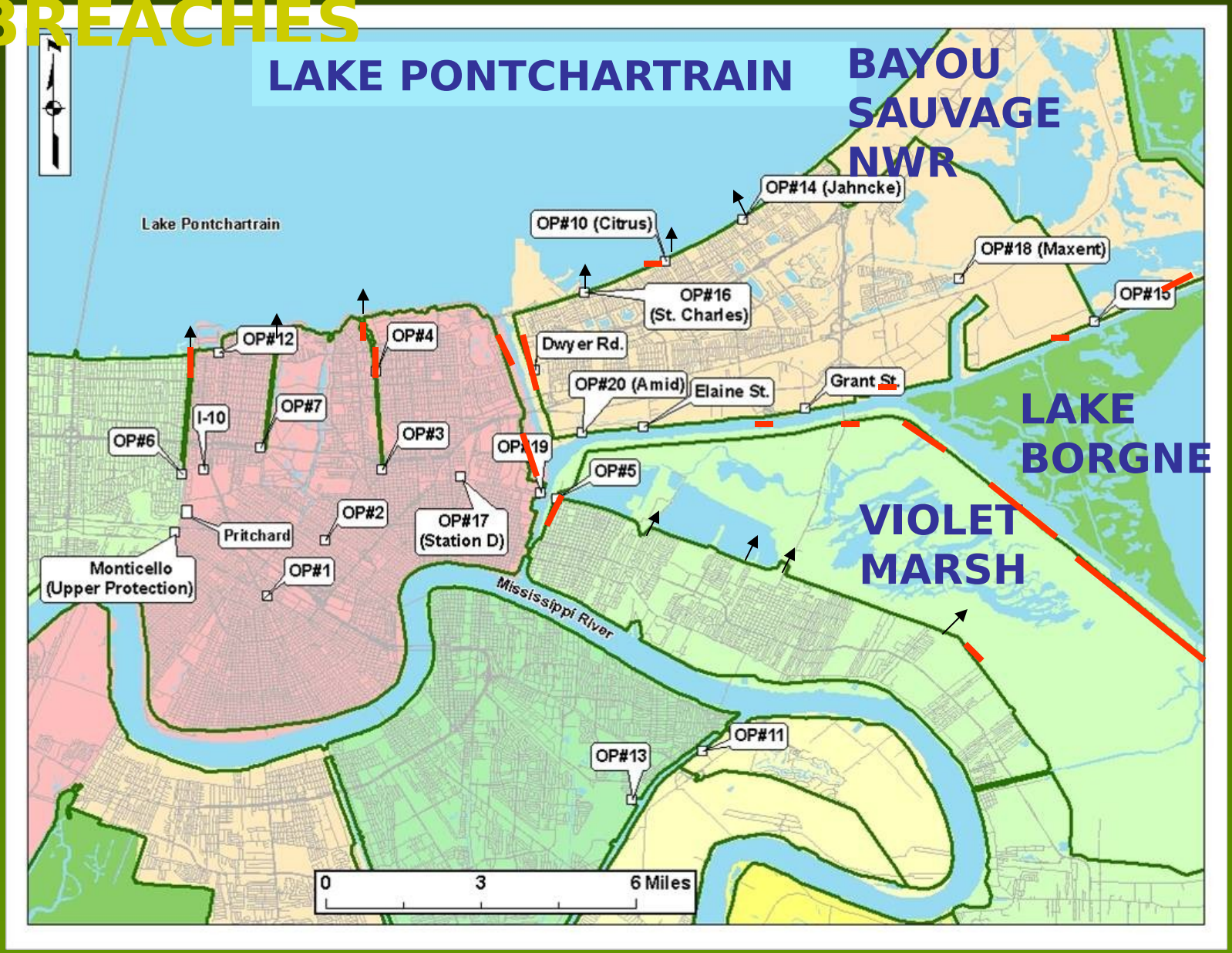
STUDY CONCEPT MODEL



Drainage Sub-basins



PUMP LOCATIONS & LEVEE BREACHES



Debris hanging 20 feet above water in Bayou Sauvage (FWS photo)

STUDY REGION:

REGIONAL WETLAND LOSS RATES:

- 1930s-1958 38 KM^2/YR
- 1958- 1974 108 KM^2/YR
- 1956- 1978 102 KM^2/YR

More Hurricanes

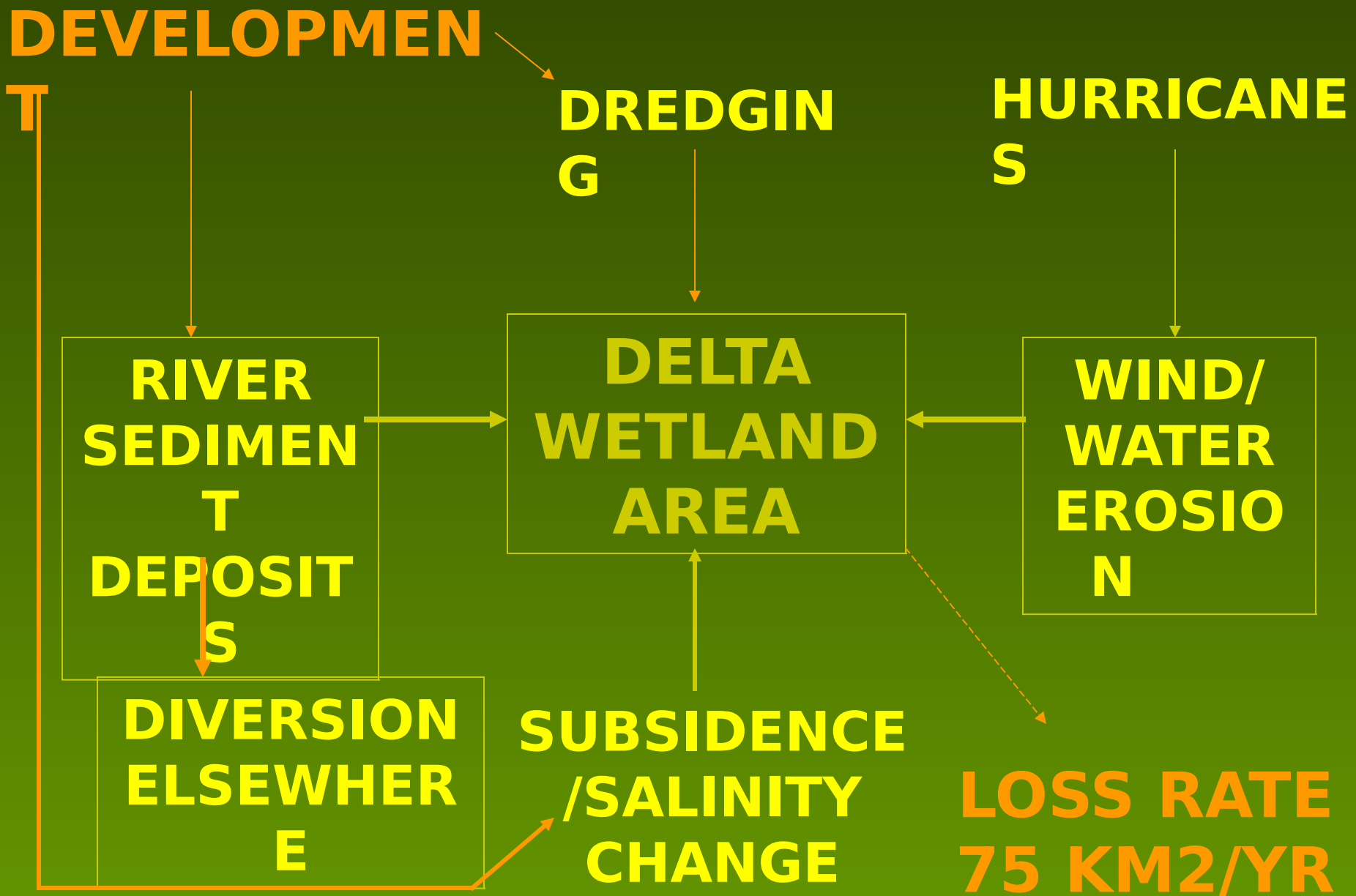
- 1974- 1983 79 KM^2/YR
- 1978- 1990 90 KM^2/YR
- 1983- 1990 66 KM^2/YR

Less Hurricanes

- 2005 -- 295 KM^2/YR (Katrina & Rita)

(118 SQ MILES)

Long-term mean about 75 KM^2/YR


DEVELOPMENT
DREDGING
HURRICANES
RIVER SEDIMENT DEPOSITS
DELTA WETLAND AREA
WIND/ WATER EROSION
DIVERSION ELSEWHERE
SUBSIDENCE /SALINITY CHANGE
LOSS RATE 75 KM2/YR

EXISTING DATA

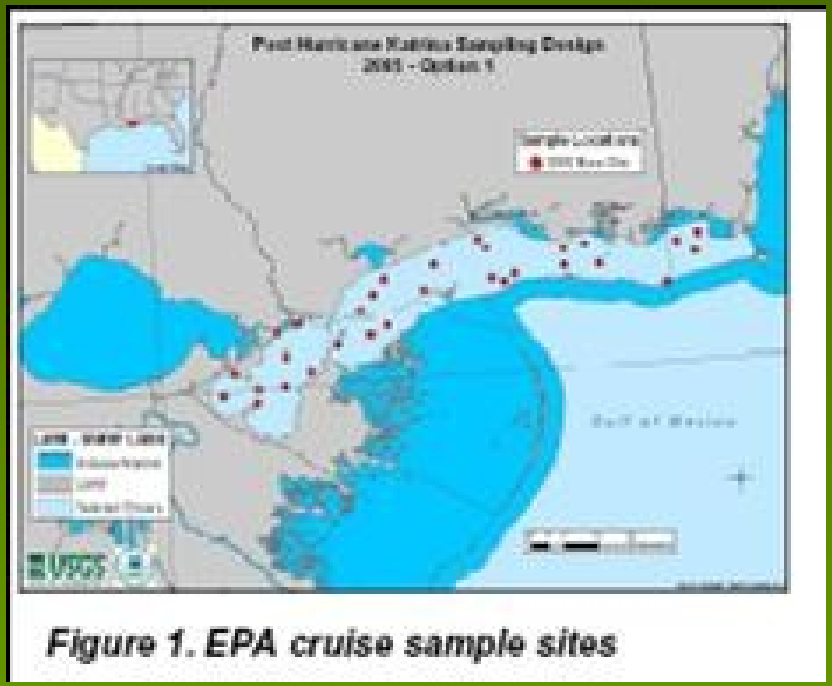
ERDC Environmental Laboratory Research Team Leaders

- Dr. Barbara Kleiss—Wetlands/Project Mgt.
- Dr. Burton Suedel—Chemical/toxicological
- Dr. Tyler Bowley—Chemical data mining
- Dr. Herbert Fredrickson—Microbiology
- Dr. Gary Ray—Fisheries, Wildlife, & Pests
- Dr. Mark Dortch—Contaminants modeling

EXISTING INFORMATION SOURCES:

- ENVIRONMENTAL PROTECTION AGENCY
- NATIONAL OCEANOGRAPHIC & ATMOSPHERIC AGENCY
- FISH AND WILDLIFE SERVICE
- U. S. GEOLOGICAL SURVEY
- LOUISIANA DEPT OF ENVIRONMENT QUALITY
- LOUISIANA DEPT OF WILDLIFE AND FISHERIES
- LOUISIANA STATE UNIVERSITY
- UNIVERSITY OF NEW ORLEANS
- THE LAKE PONCHARTRAIN BASIN FOUNDATION
- VARIOUS ACADEMIC PUBLICATIONS

SAMPLING STATIONS OF EPA/LDEQ



ORIGINAL DATA

VIOLET MARSH SAMPLING

- ERDC EL RESEARCH
- DECEMBER 2005
  - SALINITY
  - BOTTOM FAUNA
  - GENERAL WETLAND CONDITION
- FEBRUARY 2006
  - SEDIMENT CHEMICAL CONTAMINANTS
  - SEDIMENT BIOLOGICAL CONTAMINANTS

Microbiology field work sub-task

SAMPLING FOR CHEMICAL CONTAMINANTS AND BENTHIC INFAUNA IN SEDIMENTS OF VIOLET MARSH

MICROBIOLOGY SAMPLING OF SEDIMENT FOR FECAL INDICATORS

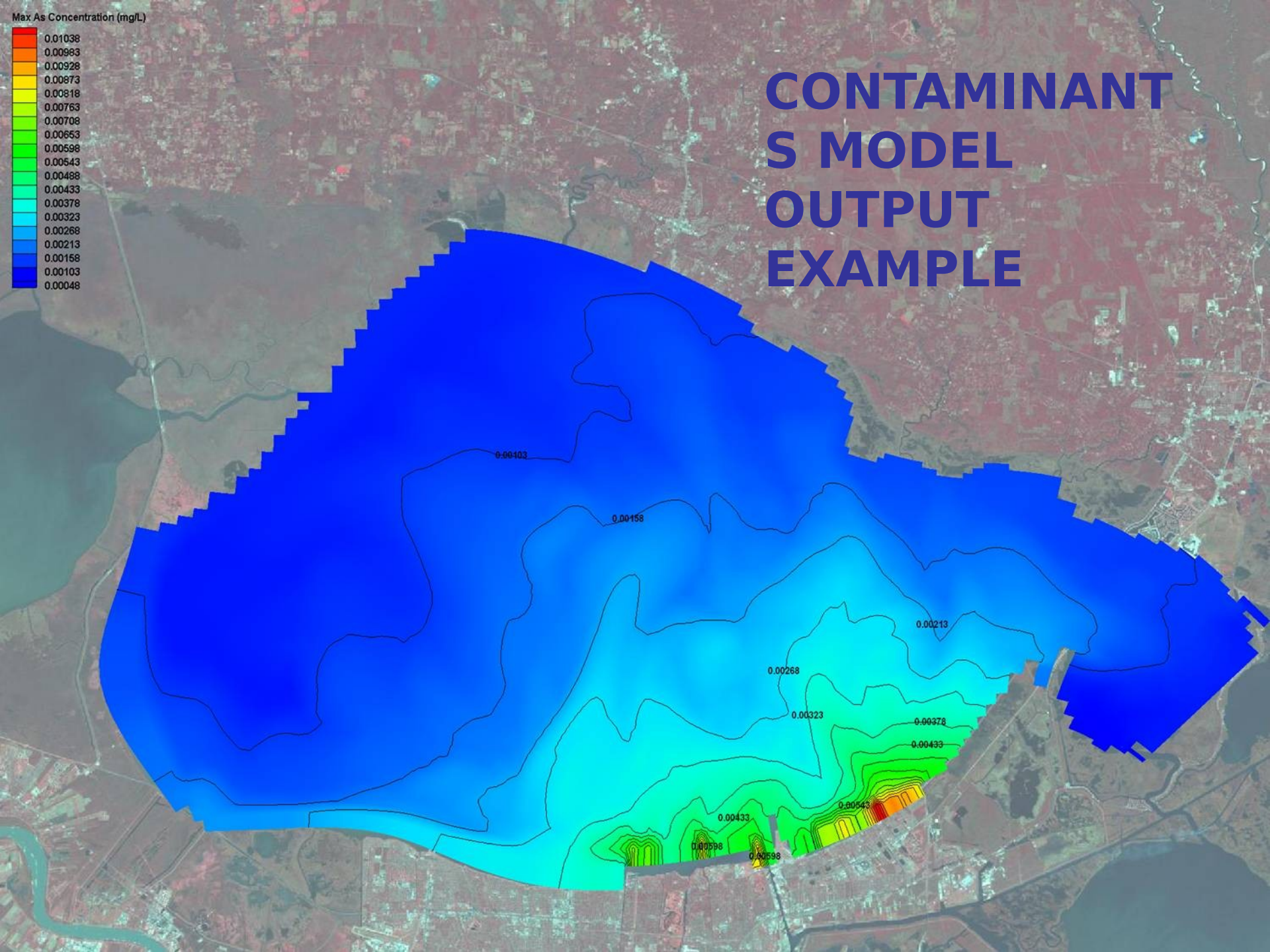
CONTAMINANTS FATE MODEL

MODELS USED

- LAKE PONTCHARTRAIN
  - CH3D HYDRODYAMIC MODEL
  - CE-QUAL-ICM WATER QUALITY MODEL
- VIOLET MARSH
  - RECOVERY MODEL
- CONDITIONS
  - ACTUAL FLOODED CONDITIONS
  - BASELINE RAINWATER INPUT ONLY

MODELED CONSTITUENTS:

- Arsenic
- Benzo(a)pyrene
- DDE
- Lead
- Fecal coliform bacteria


Max As Concentration (mg/L)
0.01038
0.00983
0.00928
0.00873
0.00818
0.00763
0.00708
0.00653
0.00598
0.00543
0.00488
0.00433
0.00378
0.00323
0.00268
0.00213
0.00158
0.00103
0.00048
CONTAMINANT S MODEL OUTPUT EXAMPLE
0.00103
0.00158
0.00213
0.00268
0.00323
0.00378
0.00433
0.00543
0.00433
0.00598
0.00598

PRELIMINARY RESULTS

POST-KATRINA OUTER ECOSYSTEMS:

- OFFSHORE WATER CONTAMINATION MET STANDARDS
- BRIEF INSHORE FECAL CONTAMINATION OF MUSSELS
- OFFSHORE FISHERIES NOT CONTAMINATED
- OFFSHORE FISHERIES INTACT—SOME INCREASED
- FISH AND SHELLFISH DECLARED SAFE TO EAT
- FRESHWATER FISH MORTALITY
- EIGHT NATIONAL WILDLIFE REFUGES CLOSED
- WIDESPREAD MAMMAL MORTALITY
- LESS WINTER WATERFOWL USE

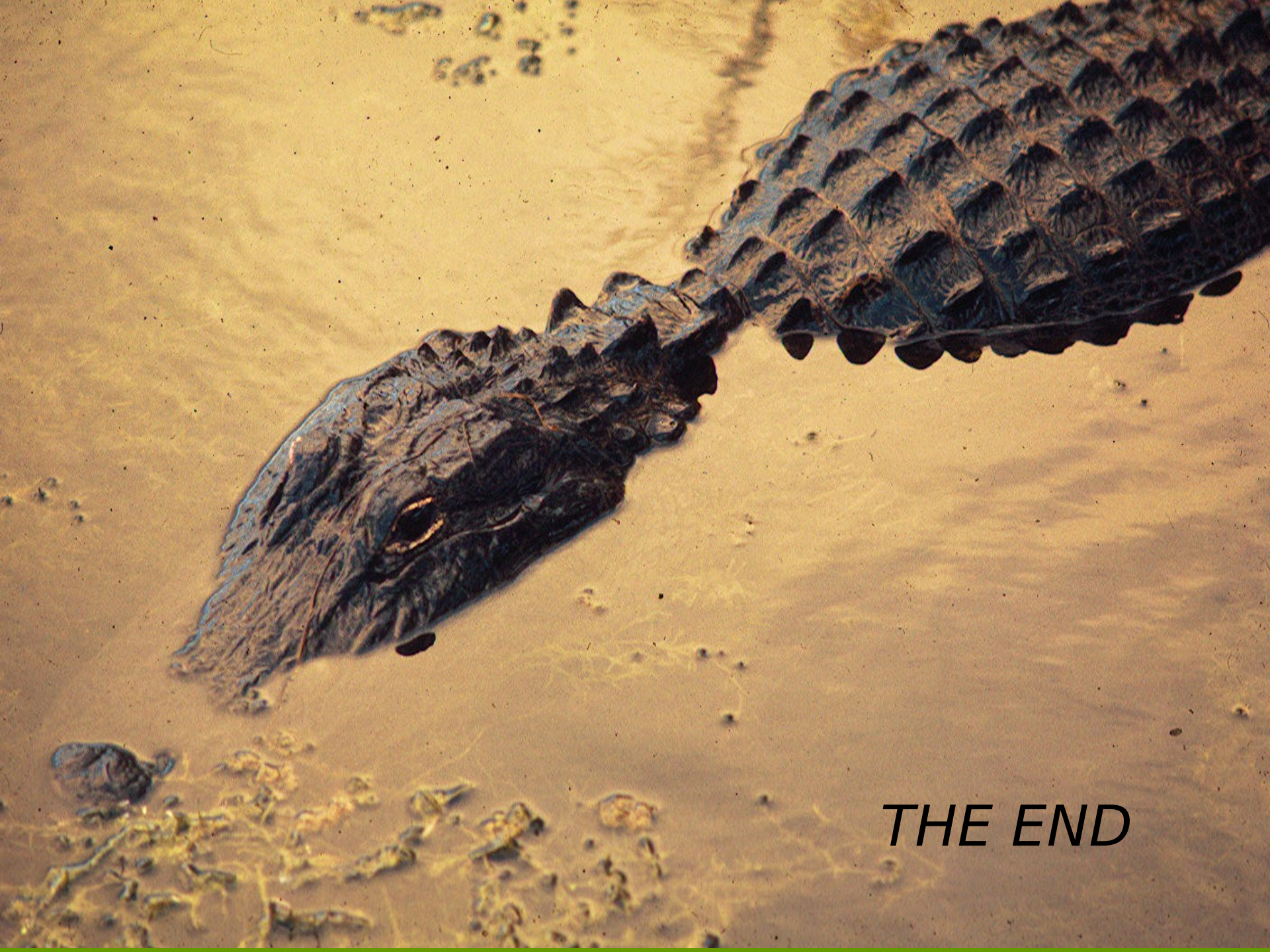
Damaged shrimp boats
(FWS photo)

POST-KATRINA PONTCHARTRAIN-BORGNE:

- FECAL BACTERIA IN WATER WAS ELEVATED BRIEFLY
- SOME METALS >STANDARDS; SIMILAR TO RAINWATER
- FRESHWATER FISH KILLS, LOW OXYGEN- NORTH SHORE
- BRIEF MUSSEL CONTAMINATION IN LAKE BORGNE
- SAME WILDLIFE IMPACTS AS FOUND REGIONALLY
- ENDANGERED GULF STURGEON NOT FOUND YET
- STURGEON OUT OF CONTAMINANTS REACH AT TIME

POST-KATRINA INNER ECOSYSTEMS:

- SOME CONTAMINANTS > STANDARDS IN FLOOD WATER
- INCREASED SALINITY IN VIOLET MARSH
- SALINITY MAY IMPACT FRESHWATER WETLANDS
- NO COMMERCIAL FISHERIES
- POSSIBLE DAMAGE TO NESTING TREES
- BALD EAGLES AND BROWN PELICANS USE WETLANDS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